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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PF14J950	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/JP2004/004928	International filing date (day/month/year) 05.04.2004	Priority date (day/month/year) 15.04.2003	
International Patent Classification (IPC) or national classification and IPC F01L1/34			
Applicant TOYOTA JIDOSHA KABUSHIKI KAISHA et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 1 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 14.02.2005		Date of completion of this report 08.08.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer Paquay, J Telephone No. +31 70 340-3944	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/JP2004/004928

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-29 as originally filed

Claims, Numbers

2-15 as originally filed
1 received on 14.04.2005 with letter of 14.04.2005

Drawings, Sheets

1/7-7/7 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/JP2004/004928

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-15
	No: Claims	
Inventive step (IS)	Yes: Claims	1-15
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

- 1 Reference is made to the following document/s/:
D1: US-A-6 079 381 (MORIKAWA JUNYA) 27 June 2000 (2000-06-27)

- 2 To independent claim 1: Document D1, which is considered to represent the most relevant state of the art, discloses (the references in parentheses applying to this document): An abnormality diagnosis apparatus (column 1, lines 34-41) that diagnoses an abnormality of an adjustable valve mechanism (50), which varies a moving characteristic of a valve in an internal combustion engine (10), said abnormality diagnosis device comprising: an input control signal module that inputs a control signal (column 4, lines 14-20, the solenoid 41 gets an input from step 108) for varying the moving characteristic of the valve; a theoretical value computation module that calculates (column 6, line 9-21) a theoretical value of a parameter relating to the moving characteristic of the valve, which is varied by the adjustable valve mechanism (50), in response to the input control signal (column 6, lines 15-17, values of the intake-air quantity and the engine speed); an observed value detection module (crank position sensor 21 and cam position sensor 22) that detects an observed value of the parameter relating to the moving characteristic of the valve, which is varied by the adjustable valve mechanism (50), in response to the input control signal; and an abnormality detection module (column 4, lines 46-54) that determines whether the adjustable valve mechanism is abnormal or normal, based on the theoretical value and the observed value.

Document D1 does not mention that the theoretical value computation module computes a physical behaviour of the adjustable valve mechanism according to a physical model. Instead of this physical model, document D1 mentions (in column 6, lines 9-21) that a map is used to determine the theoretical value. In view of this difference, the subject-matter of the first claim is new (Article 33(2)PCT).

The use of a physical model requires different soft- and hardware (among others in

view of computing power) compared to the use of a map. Therefore, the subject-matter of the first claim is not only new, but also inventive (Article 33(3) PCT).

- 1.2 To independent claim 6: The difference with the subject-matter of claim 6 and the content of document D1 is, that document D1 does not mention anything about the pressure difference between the two pressure chambers. In view of this difference, the subject-matter of the independent claim 6 is new. Computing of the pressure differences requires an entire new control strategy and the thereto related software. As this will be a quite complex operation, the subject-matter of the independent claim 6 is considered to be inventive too (Article 33(3) PCT).
- 1.3 To the independent claims 13 and 14: Like in claim 1, the difference between the content of document D1 and the subject-matter of claims 13 and 14 consists of the "Physical model". For the same reasoning as for claim 1 (in point 1.1 of this communication), the subject-matter of the independent claims 13 and 14 is new and inventive (Article 33(2) and (3) PCT).
- 1.4 To independent claim 15: Like in claim 6, the difference between the content of document D1 and the subject-matter of claim 15 consists of the "pressure difference". For the same reasoning as for claim 6 (in point 1.2 of this communication), the subject-matter of independent claims 15 is new and inventive (Article 33(2) and (3) PCT).

Re Item VII

Certain defects in the international application

- 1 To the claims 1, 6, 13, 14 and 15: Independent claims 1, 6, 13, 14 and 15 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterizing part (Rule 6.3(b)(ii) PCT).
- 2 To the claims 2-15: The features of the claims 2-15 are not provided with reference

signs placed in parentheses (Rule 6.2(b) PCT).

- 3 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

Re Item VIII

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT, because claims 1, 3, 6, 10, 13-15 are not clear.

- 1 To the claims 1, 6 and 13: Although these apparatus claims 1, 6 and 13 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.

About the claims 3 and 10: The claims 3 and 10 mention that in the model "...a rotational motion of the hydraulic vane corresponds to a translational motion of a piston". For a man skilled in the art it is not clear from the claim or the description how to implement this feature into the abnormality diagnosis apparatus. On top of that, a man skilled in the art knows that the hydraulic vane can be rotated independently from the crankshaft and thus from the piston. In view of all this, the subject-matter of the claims 3 and 10 is not clear (Article 6 PCT).

To the claims 14 and 15: Although these method claims 14 and 15 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6.

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/JP2004/004928

Enclosure of April 14, 2005
International Patent Application No.: PCT/JP2004/004928
Applicant: TOYOTA JIDOSHA KABUSHIKI KAISHA
Our ref: EP 44249

New claim 1

1. An abnormality diagnosis apparatus (100) that diagnoses
10 an abnormality of an adjustable valve mechanism (120),
which varies a moving characteristic of a valve (16) in an
internal combustion engine, said abnormality diagnosis
device (100) comprising:
- an input control signal module that inputs a control
15 signal (step S10) for varying the moving characteristic of
the valve (16);
- a theoretical value computation module (140) that
computes a physical behaviour of the adjustable valve
mechanism (120) according to a physical model provided to
20 simulate the physical behaviour of the adjustable valve
mechanism (120) and thereby calculates a theoretical value
of a parameter relating to the moving characteristic of the
valve (16), which is varied by the adjustable valve
mechanism (120), based on the input control signal;
- 25 an observed value detection module (130) that detects
an observed value of the parameter relating to the moving
characteristic of the valve (16), which is varied by the
adjustable valve mechanism (120), in response to the input
control signal; and
- 30 an abnormality detection module (150) that determines
whether the adjustable valve mechanism is abnormal or
normal, based on the theoretical value and the observed
value.